

# WOOD PALLETS AND LANDFILLS – STATUS AND OPPORTUNITIES FOR ECONOMIC RECOVERY AND RECYCLING

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**FIGURE 1. WOOD PALLETS AT A LANDFILL RECOVERY AREA.**

## **ABSTRACT**

Wood pallet recovery, repair, and recycling are sound environmental activities that can reduce both forest resource demands and waste in landfills. Our studies found that 6.16 million tons of wood pallets (or 223.6 million pallets) entered municipal solid waste (MSW) and construction and

demolition (C&D) landfill facilities in 1995. At the same time, wood pallet recovery, repair, and recycling by pallet firms reached 171 million pallets. Approximately 37.9 million pallets were recovered at landfills, mostly to low- or no-value uses. Because of the large amounts of recovered and unrecovered material landfills could be an additional source of

pallet materials to pallet recovery/repair companies. A business plan spreadsheet for a potential pallet landfill recovery operation that would feed recovery/repair companies is presented, as are other potential value-added products that can be made from recovered pallet parts. Based on early testing of the spreadsheet the economic potential looks good.

## **INTRODUCTION**

Pallets break, many are repaired and at some point they need to be disposed because they are no longer useful, or are not needed. Most of these end up in landfills. Most wood pallets entering landfill operations are landfilled, but many are recovered and reduced to fiber by grinding. These discarded pallets (Figure 1) could provide parts to repair pallets, build new pallets or could be converted into other valuable products.

Before looking at a potential pallet landfill recovery operation and the economics of such a venture, we first present and discuss the magnitude of the problem or the size of the opportunity. Many questions need to be answered concerning pallets and landfills: How much wood waste is sent to landfills? What percentage of the wood waste stream consists of pallets? Can they be recovered? Are any being recovered? What recovery products are being made? Is this trend growing? Are there opportunities to recover more wood? Are there higher value options than present recovery, which often is grinding for fuel and other low-value products?

To help answer some of these questions a study was conducted by the Center for Forest Products Marketing and Management in cooperation with the USDA Forest Service Southern Research Station unit, both at Virginia Tech. The study focused on the disposal of wood pallets and wood waste at landfills in the United States. We collected information concerning both construction and demolition (C&D) landfills and municipal solid waste (MSW) landfills. Prior to our study, little information was available regarding the number of pallets reaching US landfills for landfilling as-is and for recycling. Additional studies conducted by the Center focused on pallet repair and recycling by the pallet industry.

We will discuss economically feasible opportunities to recover pallets, pallet parts and wood for other value added products. This will include a presentation of the results from a simulated recovery/recycling operation to determine the economic potential for recovering pallet material at landfill recovery areas.

Our aim is to develop alternatives to wood pallet landfilling and recovery options that are economical, while reducing environmental problems and lumber raw material, and timber demands.

## **NEW PALLET OVERVIEW**

Wood has dominated the pallet industry as its principal raw material since palletized material handling began. Pallet production and use grew dramatically after World War II and wood remained the material of choice. Throughout this period the pallet industry has been an important market for lower grades of hardwood lumber and cants and for softwood lumber. Today, the demand for pallets continues to be strong, with recovered/repaired pallets helping to meet this demand. We estimate that demand 1995 was 560 million pallets and this demand was met with 411 million new pallets and 149 million recovered/repaired pallets. This means that about 1 out of 4 wood pallets purchased in 1995 was a recovered/repaired pallet.

Firms in the U.S. making new wood pallets and containers used 4.53 billion board feet of solid hardwood in 1995. A comparison of the results of our 1992, 1993 and 1995 studies shows the use of solid hardwood for pallets decreased slightly over this period.

The pallet and container industry uses solid softwoods in addition to hardwoods. Solid softwood consumption was an estimated 1.79 billion board feet in 1995. Mirroring hardwood trends, the use of softwood lumber and cants decreased from 1992 to 1995.

The decreasing demand for new wood materials due to repair of pallet components has developed while the demand for pallets has increased. As you will read in the next section, the increased demand has been met by increasing sales of recovered/repaired pallets or pallets made from recovered used pallet materials or parts.

## **PALLET REPAIR AND RECYCLING OVERVIEW**

Pallet recovery and recycling occurs at several levels in the use cycle. Pallet users, new pallet manufacturers, recycle only businesses, landfill operations, and others are involved. We studied the recycling activities of firms in the pallet industry (SIC 2448). This segment accounts for a large percentage of pallet recovery. However, they do not represent all pallet recovery activity; other types of organizations are involved. For example, pallet users may repair and recycle pallets within their operations or contract for a company to repair pallets within their operations.

Many factors have contributed to the recent and rapid growth of pallet recovery and recycling by the industry:

- Increased awareness of the environment and activities that affect the environment have caused a previously unconcerned public to question the use of new wood for pallets;
- Pallet producers, concerned with the availability and price of new lumber and cants, have found it

economically advantageous to repair pallets and salvage material from used pallets;

- Pallet users have turned to recycled pallets as a way of decreasing their product handling costs;
- Pallet disposal costs can be significant and increasing attention is being paid to reducing or avoiding these costs through recovery and recycling;
- Barriers to entry into pallet recycling are relatively low, resulting in an increase in the number of pallet recovery and recycling only firms (i.e., firms that do not manufacture new pallets); and
- Public concerns over the capacity and cost of landfills have resulted in laws banning pallets from some facilities.

We estimate that firms in the pallet industry recovered 171.1 million pallets for recycling in 1995. The wood content of these pallets was estimated to be 2.6 billion board feet. In previous studies, we estimated that the industry recovered 65.8 million pallets in 1992 and 83.3 million in 1993. This means that between 1992 and 1995 the number of pallets recovered by the industry grew by 160 percent.

Once recovered from the waste stream, pallets are most likely to be repaired and reused for their original purpose. Eighty-seven percent of the wood contained in pallets recovered by the industry in 1995 was used again in a pallet. This percentage includes pallets that were inspected, found not to need repair, and sold as-is for reuse. Also included are pallets that were repaired and sold and the wood content of parts that were un-nailed and used to repair pallets or build complete pallets. Less than one percent of the wood in pallets recovered by the industry was eventually landfilled.

The impact of pallet recycling can be seen by comparing the volume of new solid wood used by the industry to recovered wood use. This comparison suggests that, in 1995, more than one in four wood pallets sold by firms in the industry consisted of recovered material.

In 1995 we found that approximately ten percent of the wood (by volume) in recovered pallets was ground or chipped. This material was used for non-pallet products such as animal bedding, mulch, and for composite products. A large portion of the ground pallet material, 43 percent in 1995, was used as fuel.

## **LANDFILL WOOD WASTE AND TIPPING FEES**

### **C&D Landfills**

In 1995, wood waste accounted for 37.8% of the total waste received at C&D (Construction and Demolition) landfills in the US. In other words, almost 16 million tons of wood waste went to C&D landfills in 1995. Wood waste includes not only pallets but also boxes,

dunage, packaging, yard trimmings and other non-industrial wood discards. Landfills in the South received the greatest amounts, approximately 62% of the estimated 16 million tons of wood waste. The regions of the US differed in terms of the percentage of waste that was wood. Approximately 46% of the waste received in the Midwest was wood waste and 38.9% of waste in the South was wood waste. In the Northeast and West regions wood waste accounted for 21.3% and 18.4% of the total waste received, respectively.

Nationwide, the average tipping fee at C&D landfills was \$24.20 per ton. However, tipping fees are quite variable among and even within regions. Landfills in the Northeast region assessed a higher tipping fee (\$49.20/ton) than landfills in any other region. The average tipping fee in the Midwest (\$19.80/ton) was lower than that of any other region. The tipping fees in the South and West were \$22.50 and \$20.60 per ton of waste, respectively. Within a region, tipping fees were almost always lower for pallets delivered for processing in a recovery area rather than for those put in the landfill.

### **MSW Landfills**

In 1995 wood waste accounted for 7.3% of the total waste received at MSW (Municipal Solid Waste) landfills in the US. In other words, 21.4 million tons of wood waste went to MSW landfills in 1995. Landfills in the South received approximately 48% of the total. The Western region accounted for approximately 29% of the total wood waste received in 1995. There was little difference between the regions in terms of the percentage of waste that was wood.

Nationwide, the average tipping fee at MSW landfills was \$32.22 per ton. Again, tipping fees are quite variable between and even within regions. Landfills in the Northeast region assessed a higher tipping fee (\$53.30/ton) than landfills in any other region. The average tipping fee in the West (\$26.40/ton) was lower than that of any other region. The tipping fees in the Midwest and South were \$31.40 and \$29.30 per ton of waste, respectively. As with C&D landfills, some MSW facilities assessed lower tipping fees for separate loads of pallets received to be recycled at the landfill.

## **LANDFILL WOOD PALLET WASTE**

### **C&D Landfills**

Are wood pallets accepted at C&D landfills for landfilling as-is (i.e., without processing such as grinding)? If so, what percentage of landfills accepts wood pallets for landfilling as-is? What was the quantity of wood pallets landfilled as-is in 1995?

Currently some 67% of C&D landfills accept wood pallets for landfilling. However, almost one-third of C&D landfills have a wood or yard waste facility where pallets can be recycled. Table 1 provides the percentage of C&D operations in each region that accepted wood pallets in 1995 for landfilling. In the Northeast, only 49% of landfills accepted wood pallets for landfilling. In contrast, almost 71% of landfills in the Midwest and South accepted wood pallets for landfilling.

We were also interested in knowing the quantity of wood pallets received at landfills that were actually landfilled. We estimate that, in 1995, approximately 899 thousand

tons of pallet material was landfilled at C&D facilities in the US (Table 2). This equals 2.1% of the total C&D waste and 5.6% of total C&D wood waste landfilled in the US. If we assume that each pallet weighs 55 lb., approximately 32.7 million wood pallets were landfilled at C&D facilities in the US during 1995.

C&D facilities in the South landfilled the largest quantity of wood pallet material (i.e., 677.5 thousand tons, or 75.4% of the total wood pallet material landfilled in the US). The Midwest region landfilled the second largest quantity of wood pallet material, 15.2% or 136.3 thousand tons.

**TABLE 1. PERCENTAGE OF C&D LANDFILLS ACCEPTING WOOD PALLETS FOR LANDFILLING AS-IS AND PERCENTAGE OPERATING A WOOD/YARD WASTE RECYCLING FACILITY: 1995**

<b>Region</b>	<b>Percentage accepting wood pallets for landfilling as-is (%)</b>	<b>Percentage operating a wood or yard waste recycling facility (%)</b>
Midwest	70.8	25.0
Northeast	48.8	46.3
South	70.8	36.4
West	62.7	27.1
United States	67.1	32.4

**TABLE 2. ESTIMATED QUANTITY OF WOOD PALLET MATERIAL LANDFILLED AT C&D FACILITIES IN THE CONTIGUOUS UNITED STATES BY REGION: 1995**

Region	Estimated quantity of wood pallet material landfilled (thousand tons)	Pallet material as a percentage of total waste landfilled (%)	Pallet material as a percentage of the total <u>wood</u> waste landfilled (%)
Midwest	136.3	1.3	2.9
Northeast	56.9	1.9	8.9
South	677.5	2.6	6.8
West	28.0	0.8	4.6
United States	898.8	2.1	5.6

**MSW Landfills**

Currently some 32% of MSW facilities do **not** accept wood pallets for landfilling and over one-third have a wood or yard waste facility where pallet waste can be processed and/or recycled. Table 3 provides the percentage of landfills that accept wood pallets for landfilling. In the Northeast, only 56% of MSW landfills accepted wood pallets for landfilling. In contrast, 77% of landfills in the West accepted wood pallets for landfilling.

We estimate that, in 1995, approximately 4.2 million tons of pallet materials were landfilled at MSW facilities

in the US (Table 4). This equals 1.4% of the total waste and 19.6% of total wood waste landfilled at MSW facilities in the US. If we assume, again, that each pallet weighs 55 lb. approximately 153 million wood pallets were landfilled at MSW facilities in the US in 1995.

Municipal solid waste facilities in the South landfilled the largest quantity of wood pallet material, 2.4 million tons or 59% of the total wood pallet material landfilled. The Midwest region landfilled the second largest quantity of wood pallet material, 17% or approximately 726 thousand tons.

**TABLE 3. PERCENTAGE OF MSW LANDFILLS ACCEPTING WOOD PALLETS FOR LANDFILLING AS-IS AND PERCENTAGE OPERATING A WOOD/YARD WASTE PROCESSING FACILITY: 1995**

Region	Percentage accepting wood pallets for landfilling as-is (%)	Percentage operating a wood or yard waste processing facility (%)
Midwest	71.0	30.8
Northeast	55.9	38.2
South	63.6	49.5
West	77.3	27.0
United States	67.9	37.9

**TABLE 4. ESTIMATED QUANTITY OF WOOD PALLET MATERIAL LANDFILLED AT MSW FACILITIES IN THE CONTIGUOUS UNITED STATES BY REGION: 1995**

<b>Region</b>	<b>Estimated quantity of wood pallet material landfilled (thousand tons)</b>	<b>Pallet material as a percentage of total waste landfilled (%)</b>	<b>Pallet material as a percentage of the total <u>wood</u> waste landfilled (%)</b>
Midwest	725.6	1.8	29.3
Northeast	290.3	0.8	11.9
South	2,480.6	1.9	24.2
West	700.6	0.8	11.1
United States	4,197.2	1.4	19.6

**LANDFILL PALLET RECYCLING AND TIPPING FEES**

**C&D Landfills**

Almost one-third of C&D landfills operated a wood/yard waste recovery/recycling facility and 5.7% of C&D facilities indicated that they have plans to operate a wood/yard waste processing facility within the next two years. This suggests increasing interest in recycling of wood/yard waste, primarily to save landfill space and secondarily to reuse the wood.

Landfills that have a recycling facility are either banning the landfilling of wood pallets or providing incentives (in terms of lower tipping fees) to bring pallets to the wood recycling facilities. Landfills that have a recycling facility generally charge a higher tipping fee for landfilling wood pallets than for disposing of the pallets at the recycling facility. Among landfills with recycling facilities, the average tipping fee for wood pallets landfilled as-is was \$29.00 per ton while the fee for wood pallets that came to recycling facilities was \$22.20 per ton (Table 5).

Landfills in the Western region provide the greatest incentive to recycle pallets in terms of a tipping fee differential of over \$30 per ton.

**MSW Landfills**

As mentioned, over one-third (37.9% to be exact) of the responding MSW landfills operated a wood/yard waste processing facility (Table 3). In addition, over 6% of the respondents indicated that they have plans to operate a wood/yard waste processing facility within the next two years. As with the C&D operations, there appears to be interest in increasing the recycling of wood/yard waste.

In the US, the average tipping fee for wood pallets landfilled as-is at MSW facilities was \$34.90 per ton while the fee for wood pallets that came to processing facilities was \$23.90 per ton (Table 6). Landfills in the Northeast region provide the greatest financial incentive to recover pallets in the form of a tipping fee differential of over \$25 per ton.

**TABLE 5. REGIONAL MEAN TIPPING FEES FOR WOOD PALLETS AT C&D LANDFILLS IN THE CONTIGUOUS UNITED STATES THAT OPERATE WOOD/YARD WASTE PROCESSING FACILITIES: 1995**

Region	Tipping fee (\$/ton)	
	At landfill for landfilling as-is	At wood/yard waste processing facility
Midwest	19.70	14.50
Northeast	46.00	33.38
South	27.10	23.77
West	42.60	11.50
United States	29.00	22.20

**TABLE 6. REGIONAL MEAN TIPPING FEES FOR WOOD PALLETS AT MSW LANDFILLS IN THE CONTIGUOUS UNITED STATES THAT OPERATE WOOD/YARD WASTE PROCESSING FACILITIES: 1995**

Region	Tipping fee (\$/ton)	
	At landfill for landfilling as-is	At wood/yard waste processing facility
Midwest	29.40	19.33
Northeast	57.80	32.46
South	30.70	23.08
West	32.80	22.85
United States	34.90	23.90

## **LANDFILL WOOD PALLET RECOVERY & RECYCLING**

### **C&D Landfills**

In 1995, 3.8 million tons of wood/yard waste was received for processing (i.e., recovery) at C&D landfill facilities. Of this total, 161.9 thousand tons (4.3%) were wood pallet material. Again, if we assume that a pallet weighs 55 lb., 5.9 million pallets were processed at C&D facilities. The Southern region accounted for over 77% of this wood pallet material. Figure 2 provides the quantity of wood pallet material processed in each region.

When asked how the volume of wood pallets processed at wood/yard waste facilities has changed over the past two years, respondents were split; 19% reported an increase and 19% indicated a decrease. The average increase was 3.2% and the average decrease was 4.2%. In addition, 44% of the respondents indicated that the volume of pallets received for recycling has not changed over the past two years. Approximately 18% of the respondents reported that they have been operating the wood/yard waste recycling facility for fewer than two years and therefore could not comment on changes.

How was the pallet material used at the processing facilities? Grinding or chipping was the most common process used. Approximately 32.6% of the ground or chipped material was used for mulch, animal bedding, compost, soil amendment, and core material for particleboard. Approximately 7.5% of the reduced material was used as landfill or road cover. Another 38.4% was used for fuel. In addition, 0.9% of the pallet material was given away or sold as-is for fuel. In other words, 39.3% of the pallet material recovered was used for fuel. Approximately 12.5% of the pallet material was given away or sold for reuse as pallets, and 1.1% were repaired at the facility for reuse. Figure 3 shows the percentage of pallets landfilled and recovered and the recovery uses.

Approximately 69% of the recyclers reported that they give away ground or chipped pallet material. Of the respondents who sell ground or chipped pallets, the average (mean) sale price was \$11.01 per ton and the median sale price was \$10.50.

### **MSW Landfills**

In 1995, 7.4 million tons of wood/yard waste was received for recycling at landfill processing facilities. Of

this amount, 880.8 thousand tons (11.9%) were wood pallet material. Again, if we assume that a pallet weighs 55 lb., 32 million pallets were received at MSW processing facilities. The Southern region accounted for 60.5% of this wood pallet material. Figure 4 provides the quantity of wood pallet material recycled in each region.

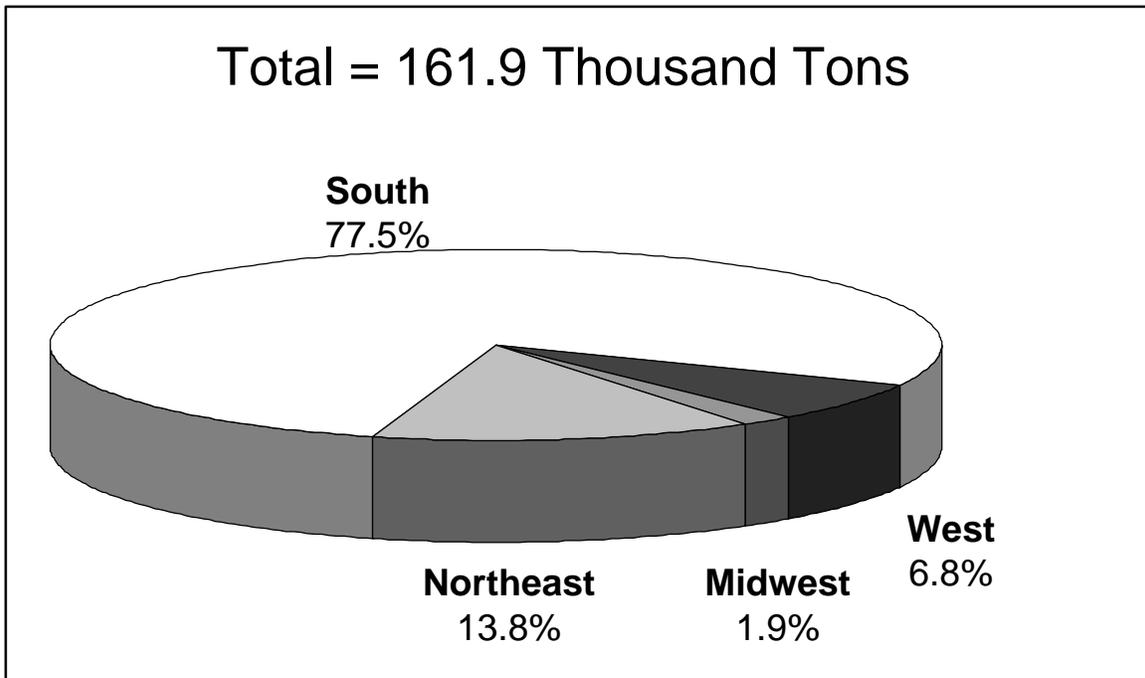
When asked how the volume of wood pallets processed at wood/yard waste facilities has changed over the past two years, 24% of the respondents reported that the volume has increased. The average increase was approximately 8%. Almost 16% of the respondents reported a decrease in volume and the average decrease was 4.3%. An additional 48% of the respondents indicated that the volume of pallets received for recycling has not changed over the past two years and approximately 13.5% of the respondents reported that they have been operating the wood/yard waste processing facility for fewer than two years.

Grinding or chipping was the most common method of processing the pallet material. Approximately 38% of the ground or chipped materials were used for mulch, animal bedding, compost, soil amendment, core material for particleboard, and similar uses. Almost 8% of the reduced material was used as landfill or road cover and another 34% was used for fuel. Approximately 3% of the pallets were not chipped and they were reused as pallets. Figure 5 shows the percentage of pallets landfilled and uses for those pallets that are recovered.

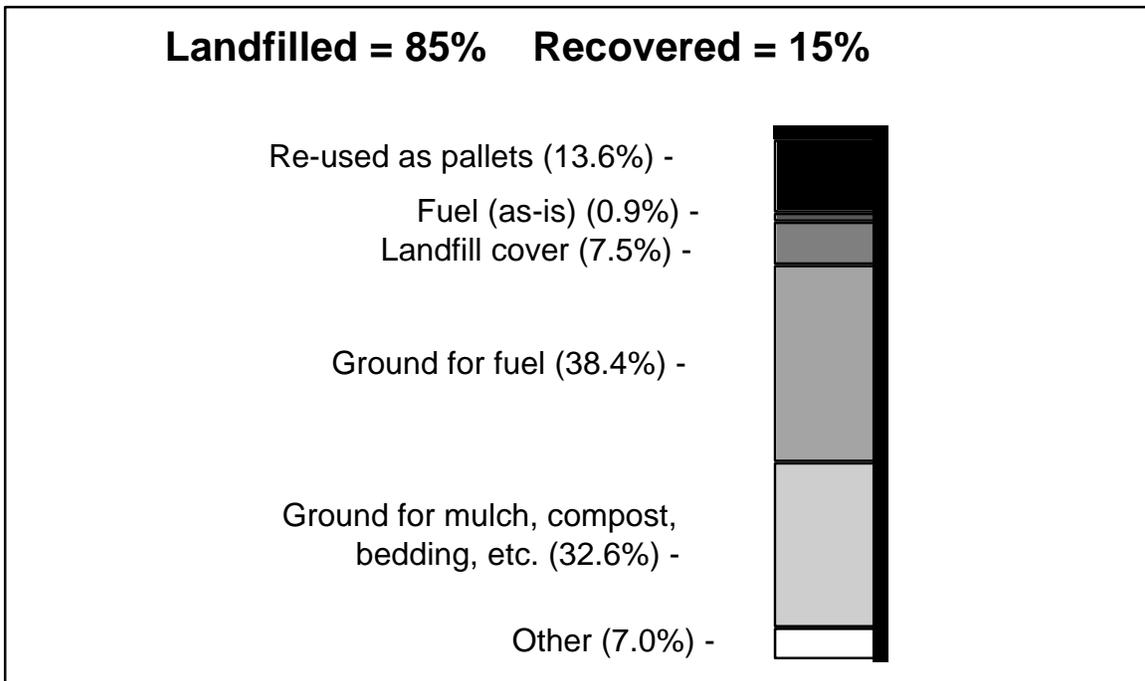
Approximately 58% of the recyclers reported that they give away ground or chipped pallet material. Of the respondents who sell ground or chipped pallets, the average (mean) sale price was \$13.17 per ton and the median sale price was \$10.67.

## **THE COMBINED (C&D AND MSW) LANDFILL PICTURE**

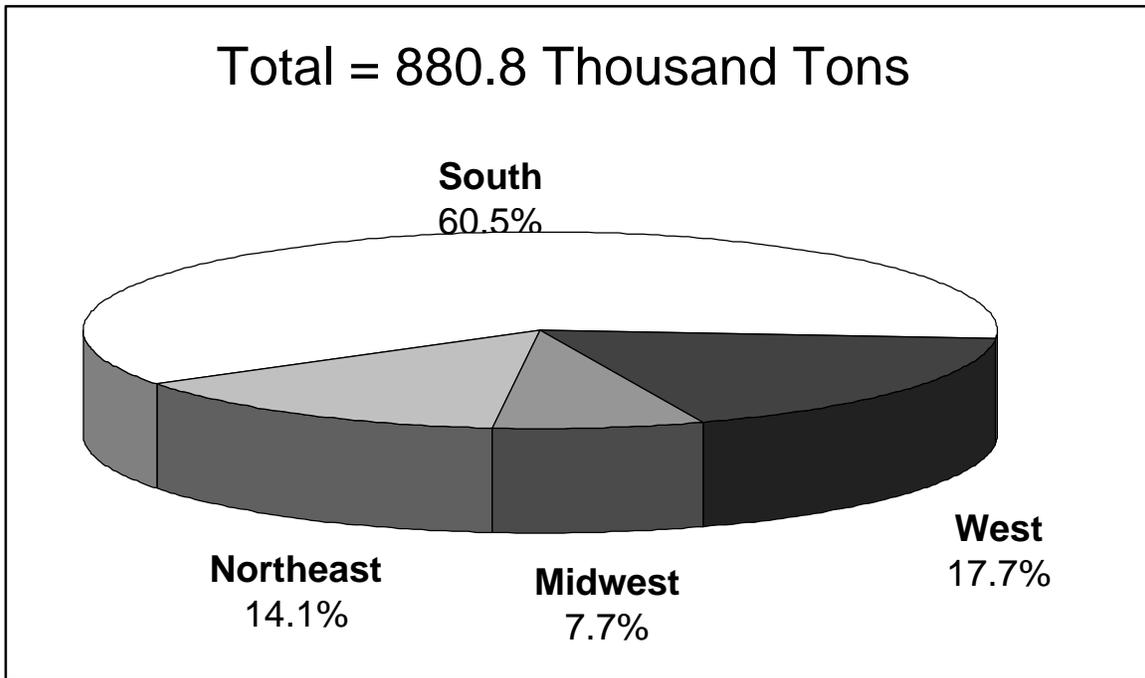
The combined totals (C&D and MSW) show that over 223 million pallets (6.14 million tons) passed through landfill gates in 1995. Approximately 17% (38 million pallets or 1.04 million tons) were recovered, mainly to little or no revenue products. Landfill operators should consider markets for pallets that would return some or more money to their facilities. Many have grinders and more would likely add grinders if they could be assured of a market for ground pallet material. They seem very interested in ways to increase revenues. Next, we will present some attractive options.



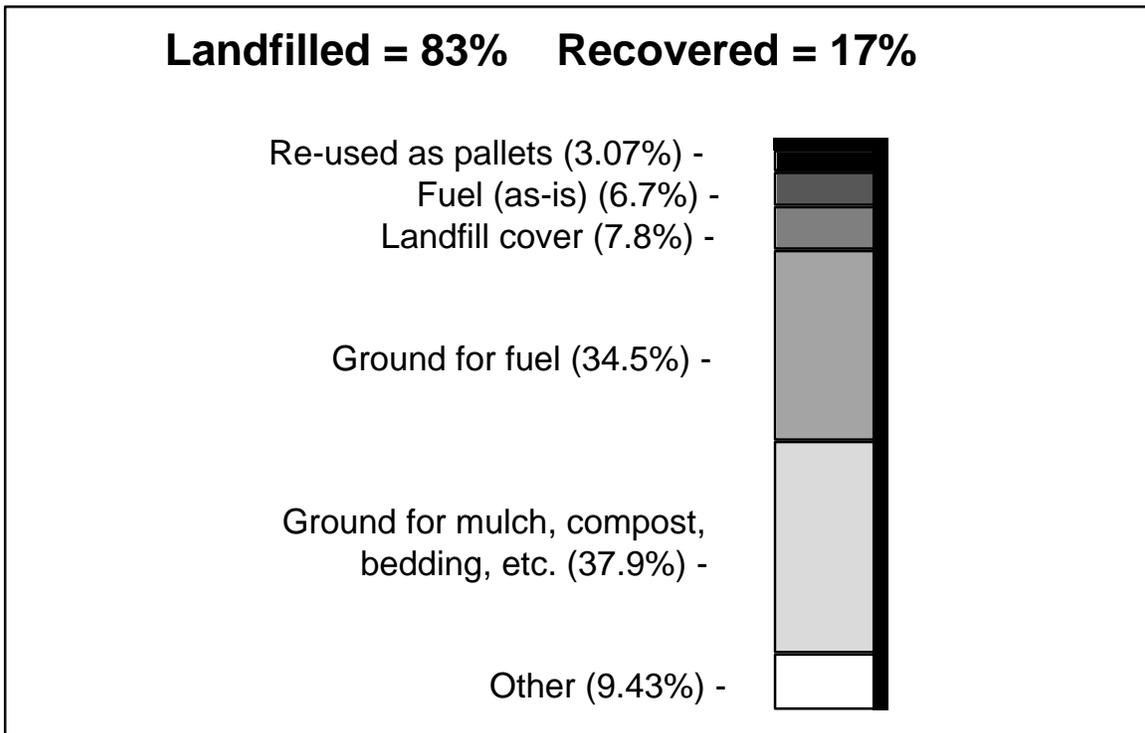
**FIGURE 2. ESTIMATED REGIONAL QUANTITY AND PERCENTAGE OF WOOD PALLET MATERIAL RECOVERED AT C&D FACILITIES BY REGION IN 1995**



**FIGURE 3. PERCENT OF WOOD PALLETS LANDFILLED AND RECOVERY AT C&D FACILITIES AND USES FOR RECOVERED PALLETS IN 1995**



**FIGURE 4. ESTIMATED REGIONAL QUANTITY AND PERCENTAGE OF WOOD PALLET MATERIAL RECYCLED AT MSW LANDFILLS BY REGION IN 1995**



**FIGURE 5. PERCENT OF WOOD PALLET LANDFILLED AND RECOVERED AT MSW FACILITIES AND THE RECOVERY USES IN 1995**

**PALLET RECOVERY OPTIONS AND THEIR VALUE**

Pallets in standard sizes needing no repairs are reusable and sellable. Pallets can also be disassembled and the parts can be converted to standard or sellable sizes and sold to pallet recovery/repair companies (Figures 6 and 7). Some of the better parts could also be converted to products such as flooring, paneling or furniture. The values of these recovery options can be expressed in terms of a standard 48"x40" pallet as shown in Table 7. A ground pallet (Figure 8) would be worth \$0.25 for fuel or up to \$1.00 if a board furnish market is available. Other uses of the ground material would be densified fuel like pallets, animal bedding, mulch and colored mulch.

The same pallet could be worth between \$3.00 – 6.00 if sold as a pallet or between \$2.00 – 3.50 if taken apart for repair replacement parts. These values depend on the quality of the pallet and how many useable parts can be removed from the pallet. The 48" by 40" pallet could be worth between \$5.00 – 8.00 in flooring produced from good deckboards with the remaining parts sold as replacement pallet parts. These values (other than the fuel fiber value) are much higher than the reported average (mean) sale price of \$13.17 per ton for ground material at C&D facilities and the reported average (mean) sale price of \$11.01 per ton at MSW facilities. We should also remember that many facilities said that they received no revenue for their ground pallet material.

**TABLE 7. PALLET RECOVERY OPTION VALUES**

<b>Pallet Recovery Option</b>	<b>Value of a Standard 48" x 40" Pallet</b>
Ground for use as fuel or mulch @ \$10/ton	\$0.25
Ground for use in board products @ \$40/ton	\$1.00
Resold without repair <sup>a</sup>	\$3.00-6.00
Disassembled for repair replacement parts <sup>b</sup>	\$2.00-3.50
Disassembled for flooring and replacement parts <sup>c</sup>	\$5.00-8.00

<sup>a</sup> Standard size pallets not needing repair but of different grade or quality

<sup>b</sup> Value range depends on the number and type of reusable parts obtained from discarded pallet

<sup>c</sup> Value based on the number of parts useable for flooring and the yield in flooring blanks from the parts and the remaining parts that can be sold as replacement parts



**FIGURE 6. RECOVERED PALLET PARTS FROM USED PALLETS  
READY FOR REUSE TO REPAIR BROKEN PALLETS.**



**FIGURE 7. A REPLACEMENT PART BEING USED TO REPAIR A PALLET.**



**FIGURE 8. CURRENT RECOVERY METHOD OF GRINDING PALLETS WITH TUB GRINDERS TO USABLE FIBER AT LANDFILL RECOVERY AREAS.**

### **THE ECONOMICS -- SAMPLE RECOVERY OPERATION**

To help private and public recovery operations evaluate the feasibility of pallet recovery, we have developed a computer spreadsheet model. The computer model requests basic information describing the pallet recovery project being considered. Among the input information requested is equipment and facility requirements, labor requirements, incoming pallet quantity and types, material processing plans, tipping fee rates, and product selling prices.

The spreadsheet model uses the input parameters to simulate the pallet recovery project's operations and to estimate the project's cash flows. Output includes a summary report, tables displaying the flow of material through the project's operations, revenues by source, and a complete cash flow analysis table. Charts illustrating the sensitivity of profits to tax rates, cost of capital rates, revenues by product or service, and key cost categories are also generated.

The summary report includes the initial cost of the pallet recovery project and the profitability using the net

present value, the internal rate of return, and the modified internal rate of return methods. The tonnage of wood diverted from landfilling or grinding and the recycling efficiency is indicated as well as the total labor cost over the life of the project. Lastly, in the summary report the average revenue generated per pallet recovered is estimated.

To illustrate the program and the potential economics of recovering pallets at a level higher than grinding we created the following hypothetical operation. In this operation, we:

- separate standard 48x40 pallets needing no repairs to sell to pallet users
- disassemble most of the remaining pallets and salvage usable parts for sales to pallet recovery/repair companies
- grind the remaining thin or defective parts, and bad pallets into fiber as is currently common, and
- consider the possibility of, at a later time, separating the best parts for conversion to products such as flooring, furniture or paneling.

The sample recovery operation that we will simulate would:

- receive 900 pallets/week in year 1 growing to 1200 pallets/week in year 5
- charge normal recovery area tipping fees (\$35.00/ton)
- offer a pallet pickup service for a higher tipping fee (\$45.00/ton)
- sell approximately 120 48" by 40" pallets/week not needing repairs in year 5 (\$4.50/pallet)
- dispose by grinding 180 pallets/week due to thin boards or an insufficient number of recoverable parts
- disassemble 900 pallets/week with industrial band saw dissemblers in year 5 (this translates into 26 pallets/hour or .43 pallets/minute)
- process if needed the recovered pallet parts to standard or demanded lengths with crosscut saws
- sell the recovered pallet parts to recovery/repair companies (\$0.20/deckboard, \$0.50/stringer and \$0.20/half stringer)
- employ 6 workers

The above operation in year 5 would:

- collect \$215,000 in total revenue/year (\$60,000 in tipping fees, \$27,000 in whole pallet sales, \$47,000 in stringer sales, and \$81,000 in deckboard sales)
- receive 60,000 pallet or 1575 tons of wood, recycle 1025 tons of pallets and parts, and grind 550 tons of wood/year
- achieve a 65% recycling efficiency in solid wood recovery (if the ground material is sold or used at the landfill this could approach 100%)
- return \$3.58/pallet received
- cost \$97,000 to establish (building, equipment, setup, working capital, etc.) and attain a 30% internal rate of return

## SUMMARY

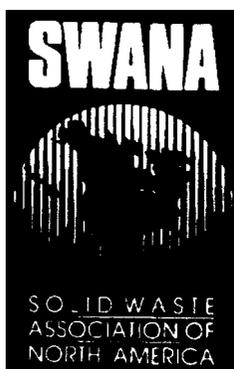
Substantial quantities of wood pallets are disposed in US landfills each year, thus rendering the potentially valuable resource useless. In total, we estimate that 223.6 million pallets were taken to Municipal Solid Waste and Construction and Demolition landfills in 1995. Only 37.9 million pallets were recovered and not landfilled. Most recovery was to low or no revenue uses.

We have shown that it can be economical to expand pallet recovery/recycling efforts in landfill wood/yard waste facilities. This could include:

- separating standard 48x40 pallets needing no repairs to sell to pallet users
- disassembling most of the remaining pallets and salvage the good or cut-back parts for sales to pallet recovery/repair companies
- sorting out the best parts for conversion to products such as flooring, furniture or paneling
- grinding the remaining thin or defective parts, and bad pallets into fiber as currently being done

Pallet material recovery/recycling at landfill wood/yard waste facilities can be economical, while reducing pressure on landfill capacity, supplying needed products back to the pallet world, while reducing hardwood and softwood timber demands. Hopefully, this would also encourage more pallets to be sent to recovery operations instead of being landfilled.

Recovery of used pallets for pallet parts or other products can be profitable and environmentally friendly.



PROCEEDINGS FROM

# WASTECON/ISWA WORLD CONGRESS 1998

SWANA's 36TH ANNUAL INTERNATIONAL  
SOLID WASTE EXPOSITION

CHARLOTTE, NORTH CAROLINA  
OCTOBER 26-29, 1998

**SWANA:** *ADVANCING THE PRACTICE OF ENVIRONMENTALLY AND ECONOMICALLY SOUND MUNICIPAL  
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